

Date: Tue, 27 Apr 93 18:38:17 PDT  
From: Info-Hams Mailing List and Newsgroup <info-hams@ucsd.edu>  
Errors-To: Info-Hams-Errors@UCSD.Edu  
Reply-To: Info-Hams@UCSD.Edu  
Precedence: Bulk  
Subject: Info-Hams Digest V93 #506  
To: Info-Hams

Info-Hams Digest                      Tue, 27 Apr 93                      Volume 93 : Issue 506

Today's Topics:

    AM Modulation Question (2 msgs)  
    AM Moulation Question (2 msgs)  
    Dual-band rubber ducks: advice needed  
    How to help an 8 yr old get a license  
        IC22U & IC22A  
    North Texas Microwave  
    Raising our profile  
    Weather Service spotter?  
    X-tal filter 75 MHz

Send Replies or notes for publication to: <Info-Hams@UCSD.Edu>  
Send subscription requests to: <Info-Hams-REQUEST@UCSD.Edu>  
Problems you can't solve otherwise to brian@ucsd.edu.

Archives of past issues of the Info-Hams Digest are available  
(by FTP only) from UCSD.Edu in directory "mailarchives/info-hams".

We trust that readers are intelligent enough to realize that all text  
herein consists of personal comments and does not represent the official  
policies or positions of any party. Your mileage may vary. So there.

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Date: Mon, 26 Apr 93 18:41:21 edt  
From: pa.dec.com!radio.nl.nuwc.navy.mil!keith@decwrl.dec.com  
Subject: AM Modulation Question  
To: info-hams@ucsd.edu

In article <1rhhr5INN1th@chnews.intel.com> jlbromley@joshua.intel.com writes:  
>The latest-style solid-state MF AM broadcast transmitters use a system  
>that has a number of gated RF amplifiers driven by an audio A/D converter.  
[ stuff deleted ]  
>I saw a 5-kW transmitter from Harris (the old Gates Radio) at NAB  
>last year that used this method.

Yup, I think that's what Harris calls "digital modulation" or something to  
that effect. They have a patent on that method, as far as I know.

There are two things about that method that are particularly interesting:

1. They get good sounding audio while only having 48 RF amplifier modules to switch off and on (at least in the version I saw.) If they didn't play any "tricks", that would be awful... it wouldn't even be 6 bit resolution. 6 bits would be 64 modules. They get around this by not having all the modules be equally weighted. Most of them are, but then there is one at half power, one at one quarter power, etc. That way they get much finer resolution than they would otherwise with 48 equally weighted modules.

2. The sampling rate in the system is very high... I forget exactly how fast it was, but 500K samples/second sticks in my mind. That may sound ridiculously fast for broadcast quality audio, but that way they don't need any special filtering. The Q in the output tuning network is high enough to take care of it. That gets around the filter problem that exists with PDM.

Pretty clever stuff.

Keith (WA2Q)

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keith@radio.nl.nuwc.navy.mil

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Date: 27 Apr 1993 01:47:42 GMT

From: saimiri.primate.wisc.edu!zaphod.mps.ohio-state.edu!cs.utexas.edu!asuvax!  
chnews!joshua!jbromley@ames.arpa

Subject: AM Modulation Question

To: info-hams@ucsd.edu

In article <754@radio.nl.nuwc.navy.mil> keith@radio.nl.nuwc.navy.mil writes:

[ Description of Harris AM scheme deleted for brevity]

>2. The sampling rate in the system is very high... I forget exactly how  
>fast it was, but 500K samples/second sticks in my mind. That may sound  
>ridiculously fast for broadcast quality audio, but that way they don't  
>need any special filtering.

I got some more info on this. They do the A/D sampling at the RF carrier frequency. That way they can switch the RF amps on or off on the zero-crossing points of the carrier wave.

>Pretty clever stuff.

I thought so too!

>Keith (WA2Q)

Jim, W5GYJ (jbromley@sedona.intel.com)

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Date: 26 Apr 1993 19:20:24 +0100  
From: mcsun!uknet!warwick!warwick!not-for-mail@uunet.uu.net  
Subject: AM Moulution Question  
To: info-hams@ucsd.edu

High-level modulation can be used in SSB systems, and work was first initiated in this area in the 50s by Leonard Kahn. His idea was termed envelope elimination and restoration. The low-level SSB signal generated would be split into two 'streams': in the 'phase' stream the signal would pass through a limiter which removes amplitude fluctuation but leaves the phase information intact; the 'amplitude' stream would envelope detect the signal, and use an amplified version of this envelope to high-level modulate the PA. The envelope would thereby be re-introduced into the signal, producing the required SSB. Efficiency would be high as the PA could be operated in class-C, or other non-linear modes.

Drawbacks to the operation of this system include time-delays in the phase/amplitude streams, imperfect high-level modulation (PA output voltage not truly linear with applied 'DC'), and AM-to-PM conversion due to non-linear reactance effects of device.

Seems like this technique hasn't been used much at all for SSB, and this is a little surprising as it can work quite well.

More recently, the technique has been re-considered as a means of permitting high-efficiency amplification of linear digital modulation schemes, employing non-linear PAs. Again, there are the drawbacks above, but feedback can be applied to correct for the non-ideal amplitude/phase response. Neutralization of the PA can help when high modulation depths are present, to reduce the feedthrough effect due to output/input capacitance, which has implications for both phase and amplitude responses. Use is made of high-efficiency modulators, particularly PWM types, to permit overall efficiencies to be several times those attainable with standard linear PAs, hence extending battery life on your average personal communicator.

Anybody tried this technique for SSB or other linear modes?

73

Simon GOGWA

Warwick University, UK.

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Date: Mon, 26 Apr 1993 19:56:39 GMT  
From: dog.ee.lbl.gov!overload.lbl.gov!agate!usenet.ins.cwru.edu!gatech!emory!  
sol.ctr.columbia.edu!usc!sdd.hp.com!col.hp.com!news.dtc.hp.com!srngenprp!  
alanb@network.UCSD.EDU  
Subject: AM Modulation Question  
To: info-hams@ucsd.edu

Mr S Browne (esrlb@csv.warwick.ac.uk) wrote:  
: In article <1rh42k\$c8l@hpscit.sc.hp.com> rkarlqu@sdd.hp.com (Richard Karlquist)  
writes:

: >  
: >Actually, plate modulation has been obsolete for at least 25 years.  
: >What is done in modern broadcast transmitters is to build a matched  
: >pair of transmitters, each of which puts out half the total power.  
: >The audio is applied to them as \*phase-modulation\*. The two transmitters  
: >are summed together at the outputs in a high-power combiner hybrid  
: >which feeds the antenna. ...

: AM signal,  $S(t) = E(t) \cos(\omega t)$  ,  $\omega t$  being radian carrier freq.

: This vector can also be generated by

:  $S(t) = E_m/2[\sin(\omega t + \phi) - \sin(\omega t - \phi)]$

: where  $E_m$  is the maximum value of  $E(t)$ , and  $\phi$  is the angle necessary to  
: satisfy the equality.

One disadvantage of this technique is that you lose quite a bit of power  
in the hybrid combiner. At modulation peaks, the two signals are in  
phase, and power output is the sum of the powers of the two power amplifiers.  
With no modulation, the two partially out-of-phase signals combine to create  
a carrier of half the amplitude (1/4 the power), a 6 dB loss.

AL N1AL

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Date: 27 Apr 93 13:21:01 GMT  
From: ogicse!emory!swrinde!gatech!mailer.cc.fsu.edu!geomag!  
zateslo@network.UCSD.EDU  
Subject: Dual-band rubber ducks: advice needed  
To: info-hams@ucsd.edu

The rubber antenna on my IC-32AT sacrificed itself yesterday to  
save the radio. I need to replace it, and I am wondering whether  
to buy another Icom antenna (FA-1443B) or buy somebody else's.

I have been happy with the Icom antenna, but if there's something much better, either electrically or physically, I'd like to know. Thanks.

Ted Zateslo, W1X0  
zateslo@geomag.gly.fsu.edu

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Date: 26 Apr 93 14:57:43 -0600  
From: overload.lbl.gov!agate!usenet.ins.cwru.edu!gatech!paladin.american.edu!  
darwin.sura.net!zaphod.mps.ohio-state.edu!usc!sol.ctr.columbia.edu!  
hamblin.math.byu.edu!yvax.byu.@dog.ee.lbl.gov  
Subject: How to help an 8 yr old get a license  
To: info-hams@ucsd.edu

My son (almost 8 yrs old) has taken an interest in my relatively new amateur radio interest (I finally got around to taking the exams last January and got the license in March). Anyway, my question is whether there are any good ways for someone that age to study for the exams. He would really like to get either a Tech or Tech+HF but I'm not sure how to best help him learn what he needs to pass those exams. I have seen both video and audio tapes that appeared to have potential but would like to hear some other experiences before I spring for the \$20-40 and find out that he can't understand a thing they are saying.

I would appreciate any help you may have to offer on this.

Bryan Peterson KB7TEW  
Peterson@phycs1.byu.edu

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Date: 28 Apr 93 01:48:16 GMT  
From: news-mail-gateway@ucsd.edu  
Subject: IC22U & IC22A  
To: info-hams@ucsd.edu

>Does anyone else in this world have a IC-22U (not the 22S, but  
>the 22 Uniform) and been successful in putting a PL board into  
>it? If so, whose board did you use, and how did you do it?  
>jd

jd, I am interested in your problem. If you will send me a copy of the manual and schematic, I'll take a look at what needs to be done. This offer also applies to the IC22A. An MC145152 will probably work.  
Cecil\_A\_Moore@ccm.hf.intel.com  
Intel Corp. CH3-91

5000 W. Chandler Blvd.  
Chandler, AZ 85226

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Date: 26 Apr 93 02:30:30 EDT  
From: usc!zaphod.mps.ohio-state.edu!darwin.sura.net!sgiblab!wetware!  
spunky.RedBrick.COM!psinntp!psinntp!arrl.org@network.UCSD.EDU  
Subject: North Texas Microwave  
To: info-hams@ucsd.edu

In rec.radio.amateur.misc, willis@cs.tamu.edu (Willis Marti) writes:  
>Anyone have a snailmail, Internet email, packet address or phone number  
>for the North Texas Microwave Society?

North Texas Microwave Society  
c/o WA5TKU Wes Atchison  
Rt. 4 Box 565  
Sanger TX 76266

NTMS Feedpoint comes out 6 times a year. They sponsor the Microwave  
Update, but it is a local club in many respects--monthly meetings and  
tune-up sessions for getting the gear running.

BTW Wondering about the Eastern VHF/UHF conference? Latest  
rumors heard on 2 meter SSB indicate that the conference has been  
postponed to mid-summer. It will probably be held around the  
Springfield MA area.

Zack Lau KH6CP/1

Internet: zlau@arrl.org "Working" on 24 GHz SSB/CW gear  
Operating Interests: 10 GHz CW/SSB/FM  
US Mail: c/o ARRL Lab 80/40/20 CW  
225 Main Street Station capability: QRP, 1.8 MHz to 10 GHz  
Newington CT 06111 modes: CW/SSB/FM/packet  
amtor/baudot  
Phone (if you really have to): 203-666-1541

-----  
Date: Mon, 26 Apr 1993 20:03:37 GMT  
From: overload.lbl.gov!agate!usenet.ins.cwru.edu!gatech!paladin.american.edu!  
europa.eng.gtefsd.com!darwin.sura.net!zaphod.mps.ohio-state.edu!cs.utexas.edu!  
sdd.hp.com!hpscit.sc@dog.ee.lbl.gov  
Subject: Raising our profile  
To: info-hams@ucsd.edu

Laura Halliday (laurahal@microsoft.com) wrote:

: Last weekend I was part of a group who provided communication  
: support for a 10k run around Vancouver, B.C. The ham radio part of it  
: went well, the repeater worked flawlessly, and it was generally a  
: textbook example of ham radio serving the community.

: Except that nobody knew who we were.

In a previous reply I mentioned the large magnetic signs that you can  
stick on the side of your car. They are yellow with black lettering  
that says "Amateur Radio Communications." I have researched the source:

The Sign Center Inc.  
POB 4097  
San Diego, CA 92104  
(619) 298-1102

Cost is (quantity 1-19) \$9.00 or ( $\geq 20$ ) \$8.10 plus tax. Shipping is  
\$5 for any quantity. Our club bought 20 and re-sold them to members  
at \$10 each. They also have bumper stickers and other items. You  
can call or write for a catalog.

AL N1AL

(No connection with the company)

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Date: Tue, 27 Apr 1993 05:10:42 GMT  
From: dog.ee.lbl.gov!overload.lbl.gov!agate!usenet.ins.cwru.edu!gatech!news-  
feed-1.peachnet.edu!darwin.sura.net!newsserver.jvnc.net!stevens-tech.edu!  
vaxc.stevens-tech.edu!u96\_sarmstro@network.UCSD.  
Subject: Weather Service spotter?  
To: info-hams@ucsd.edu

I was wondering if anybody out there knows the procedure for  
becoming a National Weather Service Skywatch/Skywarn Spotter. I just  
passed my tests (Technician-No code) and am interested in joining.  
Any help in this matter would be appreciated.

Scott

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Date: 26 Apr 93 05:20:41 EDT  
From: usc!zaphod.mps.ohio-state.edu!darwin.sura.net!sgiblab!wetware!

spunky.RedBrick.COM!psinntp!psinntp!arrl.org@network.UCSD.EDU  
Subject: X-tal filter 75 MHz  
To: info-hams@ucsd.edu

In rec.radio.amateur.misc, dihi@bsdihi.atr.bso.nl (Dick Hissink) writes:  
>Where can I buy a 75 Mhz X-tal filter, bandwidth 2,4 kHz. ???  
>What is the price for such a filter??  
>  
>Any reactions welcome!

I doubt you can afford to buy one, though I have an idea how to build one. First off, you need very high Q crystals, probably around 300,000 or better to really make this work. While I've heard it is possible to get crystals made with Qs in excess of a million, I've also heard they don't like to make such crystals. It might be related to stability--a rough rule of thumb is to cut your crystals to an accuracy of 1/10th you bandwidth--240 Hz in this case (3.2 ppm). (for reference, cheap crystals are often one order of magnitude worse with regard to both Q and frequency accuracy).

The only practical way I see to manage both is to tell your crystal maker to forget about the exact frequency--tell them you intend to put each crystal in an oven that will be set to just the right temperature to get the frequency you want. This will allow them to concentrate on getting the high Q crystals you want.

Then, having the crystals, you can measure them and design your filter. You should expect to have to re-calibrate the ovens to compensate for aging and similar effects over time. You might also figure out what you might do with the crystals if this doesn't work :-).

Zack Lau KH6CP/1

Internet: zlau@arrl.org	"Working" on 24 GHz SSB/CW gear
	Operating Interests: 10 GHz CW/SSB/FM
US Mail: c/o ARRL Lab	80/40/20 CW
225 Main Street	Station capability: QRP, 1.8 MHz to 10 GHz
Newington CT 06111	modes: CW/SSB/FM/packet
	amtor/baudot
Phone (if you really have to): 203-666-1541	

>

>



>Dick Hissink PA3DSP  
>Email:dihi@bsdihl.atr.bso.nl  
>

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Date: Mon, 26 Apr 93 16:46:04 GMT  
From: swrinde!gatech!news.byu.edu!hamblin.math.byu.edu!sol.ctr.columbia.edu!usc!  
sdd.hp.com!nigel.msen.com!caen!destroyer!cs.ubc.ca!unixg.ubc.ca!  
kakwa.ucla.alberta.ca!alberta!adec23!mark@  
To: info-hams@ucsd.edu

References <1r3idhINNrnH@rave.larc.nasa.gov>, <pschleck.735413415@cwis>,  
<ASGRI6NGP@linac.fnal.gov>t  
Subject : Re: rec.radio.amateur reorg/RFD discussion summary 4/11

carlson@linac.fnal.gov (Kermit Carlson) writes:

> There is one major reason to make an unmoderated r.r.a.bulletin; the  
>faster changing data could move more quickly.

Sorry, DX and ARRL reports are directly posted. There would be \*no\*  
difference in posting speed. Some of the AMSAT reports are currently reposted  
because of the momentum of the previous system of posting. I was hoping for  
a fix to occur at the mail-to-news gateways (but have not yet got any  
responses from the admins yet) to allow cross-posting.

Keep in mind, Kermit, that one of the goals of rec.radio.info is to  
try to get the articles posted at the source. news.answers operates under  
the same paradigm ... there is \*no\* difference in posting speed between  
what we are doing now and a unmoderated group when it comes to periodic  
previously approved bulletin sources (if there is, I am working hard to  
fix that, broken automated tools not-with-standing :-).

>Also, unless I am missing something, the DX, AMSAT, and ARRL Bulletins  
>do not always appear on rec.radio.info within a day.

Blame this on propagation through the net, you are seeing them as fast as  
the news can flow ... Moderation does not necessarily mean all the  
bulletins have to be hand approved by the moderator (sometimes it simply  
requires quick hands on the cancel article keys :-)

Ciao -- Mark

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Date: Mon, 26 Apr 93 16:31:24 GMT  
From: swrinde!gatech!news.byu.edu!hamblin.math.byu.edu!sol.ctr.columbia.edu!usc!

sdd.hp.com!nigel.msen.com!caen!destroyer!cs.ubc.ca!unixg.ubc.ca!  
kakwa.ucs.ualberta.ca!alberta!adec23!mark@  
To: info-hams@ucsd.edu

References <697L03Bvd0aw00@amdahl.uts.amdahl.com>, <OKGNY\_ZSK@linac.fnal.gov>,  
<pschleck.735409910@cwis>.u  
Subject : Re: rec.radio.amateur reorg/RFD discussion summary 4/11

pschleck@cwis.unomaha.edu (Paul W Schleck KD3FU) writes:

>carlson@linac.fnal.gov (Kermit Carlson) writes:

>> I still believe that r.r.a.bulletin for bulletins w.r.t. amateur  
>>radio would serve a valid purpose. Not that the purpose of r.r.info  
>>should be undercut; instead there is interest in a newsgroup for  
>>solar, propagation, DX, AMSAT, and ARRL bulletins without the clutter  
>>of programming schedules of broadcast stations. Why dont we put it  
>>to a \*VOTE\*? I dont see an unmoderated newsgroup for .bulletins as  
>>a problem....

Well, net-wisdom indicates that you would have more noise in r.r.a.bulletin,  
if left unmoderated, than the poultry number of non-amateur postings in  
r.r.info could ever create. If made moderated, it would be painless,  
in many respects. But I look at the 'noise' in r.r.info and r.r.a.bulletin  
looks silly ... Even sans a kill file/filtering, three keystrokes a week  
extra doesn't sound like a problem ;-)

>Well, even if the newsgroup is perfectly behaved, it WILL steal the  
>thunder from rec.radio.info, because given the choice between posting  
>right away, and waiting for a moderator to deal with it, many will  
>choose the former, and rec.radio.info may starve.

r.r.info would starve, then that is what the population asks for ... ;-}  
Besides, the delay to posting is pretty small (<6hrs) minus the mandatory  
beauty sleep ...

>We already have a relatively straightforward bulletin-handling scheme  
>with rec.radio.info, with a dedicated moderator whom I'm sure would  
>prefer not to significantly increase his workload (either in  
>administering a second group if moderated, or campaigning for more  
>people to post also to the moderated rec.radio.info newsgroup if  
>unmoderated).

Ya, what he sez!

-- Mark

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Date: Mon, 26 Apr 93 17:15:07 GMT

From: swrinde!gatech!news.byu.edu!hamblin.math.byu.edu!sol.ctr.columbia.edu!usc!  
cs.utexas.edu!uwm.edu!caen!destroyer!cs.ubc.ca!unixg.ubc.ca!kakwa.ucs.ualberta.ca!  
alberta!adec23!mark@network.  
To: info-hams@ucsd.edu

References <6daa03V5d0H300@amdahl.uts.amdahl.com>,  
<1993Apr22.165822.3848@samba.oit.unc.edu>, <pschleck.735520488@cwis>wm.e  
Subject : Re: rec.radio.amateur reorg: current/evolving proposal 4/21

pschleck@cwis.unomaha.edu (Paul W Schleck KD3FU) writes:

>Now that others have mentioned it, I too feel that equipment has the  
>potential to lump together dissonant categories in amateur radio.

As the fog lifts, I feel myself compelled to support \*.tech again as the  
technical group ;-} but \*any\* name will do (\*.homebrew/construction/tech).

To separate 'ICOM better then Kenwood' that are bound to be part of a  
\*.equipment/products group from the technical discussions is going to be  
hard. They are not prevalent at the moment so it is hard to feel that  
we would have a problem (but the concentration in the group may start  
them). Besides, everyone knows ICOM is better then Kenwood ...

>I suspect that the decision to go with \*.equipment resulted from an  
>inability for the group to agree on either \*.construction or \*.homebrew.  
(or .tech) We can all agree, I am sure, that it would be nice to  
separate equipment reports and religious wars over what is a better peice  
of equipment from truly technical discussions about electronics and  
radio (cross posted to sci.electronics :-). Kit building, tuning and  
modifications may also be part of \*.homebrew. Mod postings may have a problem  
with focus, though ...

>If given the choice between \*.equipment, or a combination of \*.products  
>and \*.homebrew, I would prefer the latter and to avoid a potentially  
>problematic \*.equipment group,

Very persuasive Paul, you have me united here too ...

Ciao -- Mark

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Date: Mon, 26 Apr 93 16:15:18 GMT  
From: swrinde!gatech!news.byu.edu!hamblin.math.byu.edu!sol.ctr.columbia.edu!  
zaphod.mps.ohio-state.edu!caen!destroyer!cs.ubc.ca!unixg.ubc.ca!  
kakwa.ucs.ualberta.ca!alberta!adec23!mark@network.  
To: info-hams@ucsd.edu

References <1r0oahINN26v@rave.larc.nasa.gov>,  
<697L03Bvd0aw00@amdahl.uts.amdahl.com>, <1r3idhINNrn timer@rave.larc.nasa.gov>bc.ca  
Subject : Re: rec.radio.amateur reorg/RFD discussion summary 4/11

zawodny@arbd0.larc.nasa.gov (Dr. Joseph M Zawodny) writes:

>This might work for now but what will rec.radio.info become in a few months or  
>years?

\*I\* am not sure what will happen to rec.radio.info after the r.r.a.misc  
reorg. I think it would be best to just wait and see. I know one thing,  
searching for bulletin posters will be harder ... ;-)

>>Or is the intent to remove bulletins from r.r.a.misc? I'll assume that's it.  
>This is precisely what I was trying to do. Good assumption!

This will happen with the re-org (r.r.a.space, r.r.a.emerg-serv,  
r.r.a.dx/operating) anyways. \*some\* may continue (even cross posted) to  
r.r.a.misc (not my doing, just me reading into some peoples motives for  
posting information).

Ciao -- Mark

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Date: Tue, 27 Apr 1993 02:27:26 GMT  
From: dog.ee.lbl.gov!overload.lbl.gov!agate!usenet.ins.cwru.edu!gatech!  
darwin.sura.net!news-feed-1.peachnet.edu!umn.edu!csus.edu!netcom.com!  
wa2ise@network.UCSD.EDU  
To: info-hams@ucsd.edu

References <1qevrf\$4t@hpsc.it.sc.hp.com>, <1qf44aINN1l@rave.larc.nasa.gov>,  
<1993Apr23.191808.10835@rwwa.COM>et  
Subject : Re: Cable TVI interference

If I remember rightly, there is a pulsating set of tones piped thru the CATV  
systems (somewheres near the FM broadcast band). And that the cable company  
trucks listen for this as they roam around town. If you can hear it over  
the air and not cable....

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Date: Mon, 26 Apr 93 22:32:31 GMT  
From: mentor.cc.purdue.edu!noose.ecn.purdue.edu!en.ecn.purdue.edu!n9ljx@purdue.edu  
To: info-hams@ucsd.edu

References <20APR93.19314607@nauvax.ucc.nau.edu>,  
<1993Apr24.155519.6190@n5ial.mythical.com>,

<930425.131406.1I8.rusnews.w165w@garlic.sbs.com>u  
Subject : Re: no-code defense

In article <930425.131406.1I8.rusnews.w165w@garlic.sbs.com> system@garlic.sbs.com  
(Anthony S. Pelliccio) writes:

>little bit bent out of shape. As for the opposition to the no-code  
>license, well... if you look at QST roughly 10 years ago there's a  
>violent no-code stance in it.

>

>Tony

>

This is something that amazed me. I was browsing thru a QST from 1982  
or 83 looking for some modification articles. I started looking at  
the letters column and couldn't believe there were arguments going  
then about needing/not needing a codeless class of license.

And then I started perusing the ads. Everyone complains about the  
price of gear, but it hasn't changed that much in the last 10 years.  
Of course my 10 year old TS430 only has 8 memories as opposed to 100,  
but I don't even use all of my 8!

Yep - not much has changed in the past 10 years in amateur radio. I  
hope in another decade we won't be able to say the same thing.

--sas

--

Scott Stambaugh - N9LJX  
Operations Supervisor, ADPC  
Purdue University  
West Lafayette, IN 47907-1061

internet: n9ljx@ecn.purdue.edu  
phone: 317 494 7946

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End of Info-Hams Digest V93 #506

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